

Supply-Chain Risks: A Credit Perspective

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This report does not constitute a rating action



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Key takeaways

- Given supply-chain events and bottlenecks in 2020-2022, S&P Global Ratings took associated negative rating actions on more than 200 corporate issuers, consisting of downgrades, placements on CreditWatch with negative implications, or outlook revisions to negative.
- The complexity and interconnectivity of supply chains can, depending on the severity of the risk of disruptions, impact issuers' credit worthiness (business risk profile, financial risk profile, and liquidity, etc. under our corporate methodology, for example), broader economic performance, and long-term inflation.
- Questioning and analyzing key factors that might affect supply-chain linkage, individual supply-chain metrics, wider economic indicators, and topology analysis can be extremely beneficial to understand interconnectivity and where and when supply-chain problems may have significant negative consequences for an entity or industry.

International supply chains linking resources to manufacturing and manufacturers to the buyers of finished goods are the highways along which globalization has driven decades of economic growth. Yet as events in recent years have proven, those highways are prone to jams and accidents that can affect organizations' credit worthiness and the global economy.

Tensions between the U.S. and China, COVID-19, semiconductor shortages, shipping shortages, temporary blockages in shipping routes, and conflicts can--as we have seen--take their toll on the free flow and cost of resources and goods. Little wonder that the supply-chain risk, a measure of the extent to which supply-chain disruption will result in financial or operational damage to an organization and economic conditions, has risen in prominence.

While companies and governments seek to evaluate and manage supply-chain risks, depending on the severity and duration of a disruption, there may be no timely or immediate panacea. S&P Global Ratings takes into consideration supply-chain disruptions where their materiality and severity could dampen the capacity and willingness of an entity to meet its financial commitments. For example, under our corporate methodology framework (see Appendix), we can incorporate supply-chain disruption risk (if material and relevant) within a company's business risk profile including our view of a company's competitive position or volatility of profitability. We may also capture the risk in our assessment of a company's liquidity.

The story of 2023 so far has been one of supply-chain normalization. However, there are significant uncertainties ahead over corporate strategy, global trade policy, and the implementation of environmental measures, according to a report by S&P Global Market Intelligence, a division of S&P Global, "Time, Tariffs And Tracking: Fourth Quarter 2023 Supply Chain Outlook," Sept. 27, 2023. Supply-chain activity has largely returned to normal, driven in part by a slowdown in demand (see chart 1). As of August 2023, new manufacturing orders globally had been in decline for 14 straight months, according to S&P Global PMI data. Therefore, backlogs of orders have remained at their lowest since the start of the COVID-19 pandemic. That has had a knock-on impact on quantities of purchases, which have declined in a similar period, though the rate of decline has slowed since June. That would suggest that manufacturers have cut activity, resulting in stocks of finished goods, which have fallen for the past four months.

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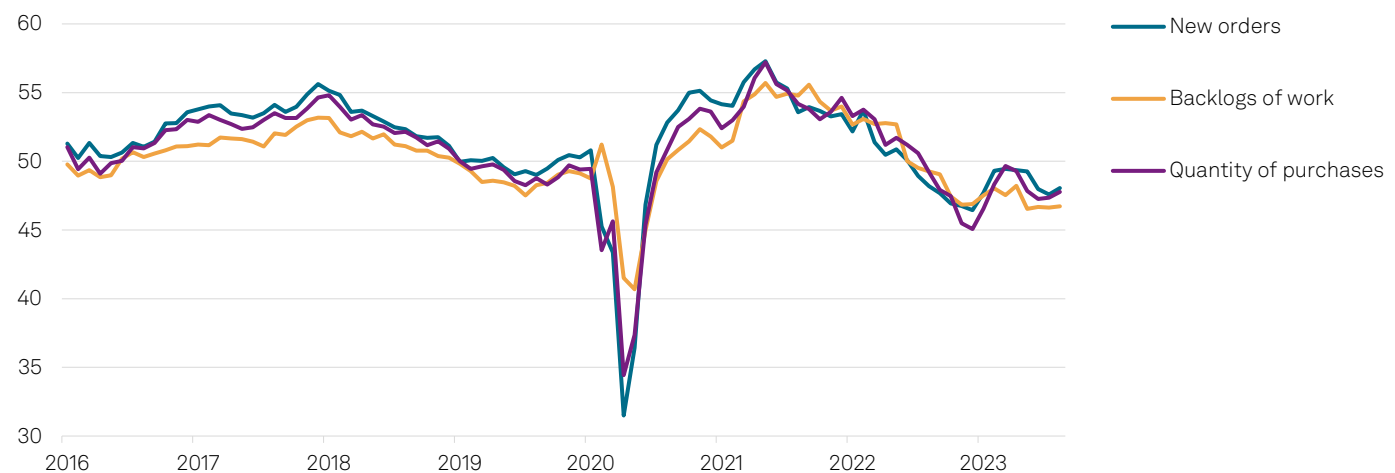
The declaration of war by Israel on Oct. 8, 2023, and supply chain impacts will depend on the escalation pathway. A report by S&P Global Market Intelligence, a division of S&P Global, "[Ports electronics and healthcare: Supply chain impact of conflict in Israel](#)" Oct. 10, 2023, highlighted key areas such as the port of Ashdod near Gaza which remains operational as at Oct. 9, 2023, and that some of the country's largest export lines including pharmaceuticals (US 2.17 billion), telecom equipment (US 2.62 billion), aerospace (US 3.15 billion) remain economically important should there be any operational or logistics disruptions in the event of escalated conflict.

In the medium to longer term, we still expect disruption events stemming from existing or new geopolitical conflicts, economic and protectionist pressures, governments and industries exploring further decoupling strategies, climate events such as adverse weather, cyber-attacks, and potential industrial action in some sectors.

Chart 1

Manufacturing supply chain activity in decline for over a year

Manufacturing PMI, > 50 = improvement since previous month



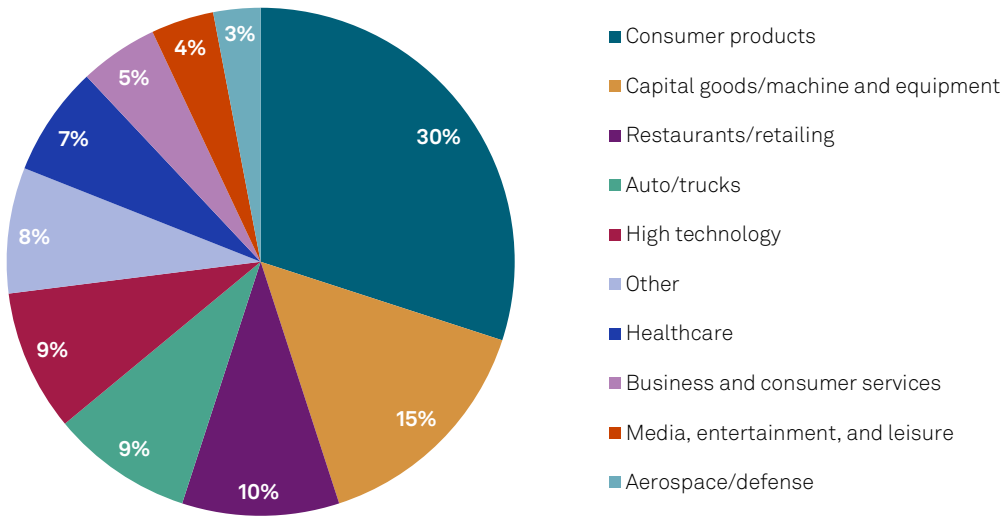
Source: J.P. Morgan, S&P Global PMI, © S&P Global

Impact Of Supply-Chain Events: Key Rating Observations

From the onset of COVID-19 in early 2020 to the end of last year, supply-chain disruptions caused negative rating actions on more than 200 corporate issuers, consisting of downgrades, CreditWatch negative placements, or outlook revisions to negative. Most of these actions were taken during 2021 and 2022. Chart 2 shows the distribution of corporate industries in which negative rating actions occurred. Consumer products experienced the largest number of negative rating actions stemming from supply-chain snarls, accounting for 30% of the activity.

Chart 2

Supply chain related negative rating actions by industry 2020 to 2022



Source: S&P Global Ratings.

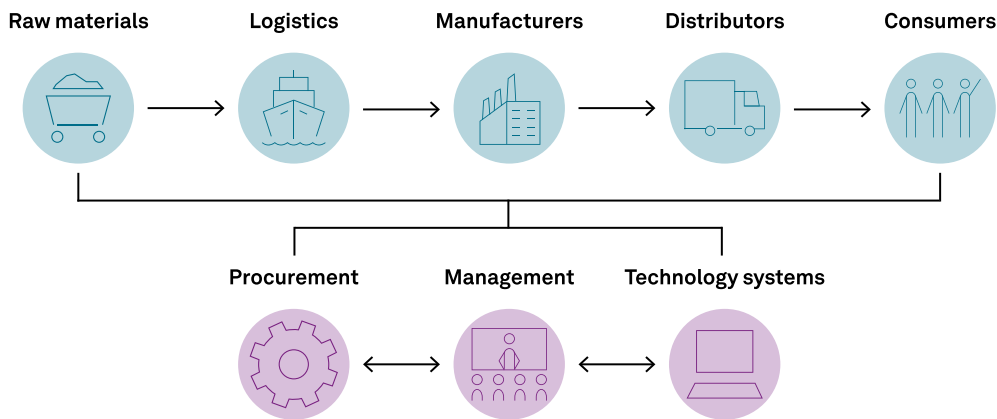
Chains And Their Links Can Be Complex

To create a shared understanding of the supply-chain risk it is necessary to start with a common definition of a supply chain. That may seem evident, but it is not necessarily simple given the range of variables involved and the blurring of boundaries between supply-chain functions and other business operations.

Broadly speaking, a supply chain involves processes that connects raw materials, components, and goods (and services) before their final sale to end-consumers. The chain will typically involve logistics operations, IT systems, procurement, distribution, and management functions (see chart 3).

Chart 3

Supply chain: From raw materials to consumer¹



Sources: S&P Global Ratings, Chartered Institute of Procurement & Supply (Intelligence Hub)¹.

Within each stage of the supply chain, there may be operations that overlap (for example, a logistics operation could deliver raw materials to multiple factories), that operate in parallel (two factories manufacturing components for the same finished products), or that are sequentially dependent (raw materials are needed before manufacturing can happen). And at each stage, operations may share (or rely on different) procurement, management, and IT systems, which could expose entities to cyber risk (e.g., the recent Port of Nagoya cyber-attack incident which resulted in systems closing for two days).

An important point to note in today's supply-chain management is that as technology systems can enhance the management and monitoring of supply chains, they can in themselves introduce risk, if not managed. A supply chain today, because of cloud computing and related software, can mean reliance on third-party systems that can increase the risk of digital cyberattacks that can shut down points along a supply chain and potentially result in a domino effect.

Supply chain models²

All supply chains share some basic characteristics, due to the common challenge of getting goods to market. Yet the ways in which different supply chains meet those challenges can vary considerably depending upon management preferences, risk tolerance, etc. The different models outlined below are examples of the most common supply-chain types, though they are often adapted to meet specific industry, individual, and company requirements.

Continuous flow model: Aims to deliver steady supply that closely matches stable demand. Typically suits mature industries with predictable markets.

Just-in-time (JIT) / responsive model: Materials are moved just before they are needed at each level of the supply chain. This reduces inventory and its related costs.

Efficiency led model: Seeks to minimize waste, including idle services and machinery downtime, by matching supply and demand using accurate forecasts.

Flexible/agile model: This maintains excess capacity and a reconfigurable process flow to be able to meet unpredictable customer orders. The agile version of this model typically refers to smaller batch production often on a bespoke basis.

A custom-configured model: May draw on other model types but is specifically configured to produce a specific product or service.

The complexity inherent to supply chains makes their assessment difficult. That is not least because complexity also means supply chains are vulnerable to a wide range of problems from a broad range of sources. They include:

- Geopolitical tensions and conflict. The effects of this can range from the imposition of tariffs that shift the economics of established supply chains, to sanctions and military action that deny access to supply chain elements. Such tensions can also come with other supply-chain risks such as asset seizures and sabotage, including through state-backed cyber-attacks (see "Cyber Threat Brief: How Worried Should We Be About Cyber Attacks On Ukraine?", Feb. 22, 2022).

- Labor and resource constraints. Shortages of inputs can emerge slowly (for example as labor markets tighten) and be predictable (a mines resource life). But they can also be rapid and unpredictable (for example, due to unforeseen regulatory changes, industrial action, cyber-attacks, and natural disasters).
- Supply and demand shifts. Changes in consumption habits can lead to demand spikes for inputs, and thus strains on associated supply of raw materials, services, or manufactured goods. Rapid dips in demand can also lead to significant stress if supply chains need to be scaled back and contracts renegotiated (see “Slowing Demand Leaves U.S. Companies Overstocked As Turnover Ratios Decline,” published on May 22, 2023, by S&P Global Market Intelligence).

As Strong As The Weakest Link

A material disruption at any point across a supply chain can have significant consequences for a business’s ability and willingness to meet its financial obligations, and thus an impact on credit worthiness. Recent, high-profile examples of supply-chain problems that rattled supply-chain links include restrictions on Russian gas and Ukrainian grain supplies due to the conflict, container and shipping shortages in 2021 and 2022, and the semiconductor shortages that began in 2020.

Supply-chain issues can often be beyond an organization’s control (or even ability to foresee) where they occur at arms-length suppliers, or manifest at regional or global levels. Supply-chain shocks caused by political events, environmental issues, or conflict can result in widespread disruption that are particularly difficult to evade—such as higher inflation, slower economic growth, and ultimately policy rate changes (see “Global Macro Update: Growth Forecasts Lowered On Longer Russia-Ukraine Conflict And Rising Inflation,” May 17, 2022).

The severity of disruption, or distortion, experienced by a supply chain will generally vary depending on a host of factors including the structure (or model) of supply chain adopted by an organization, the size and duration of the root cause, the complexity of the resulting problem(s), and the affected parties’ ability to rectify issues or recalibrate channels to avoid problems.

Table 1 provides examples of useful questions that probe key factors that might influence and affect a supply chain and its potential risks.

Table 1

Supply-chain risk: useful questions

	Supply-chain model <ul style="list-style-type: none"> • What type of supply chain model(s) are used by an organization? (i.e., continuous flow, JIT; efficiency led...) • What are the supplier relationships? • What could be done to improve a company's supply chain management? • What factors are key to the supply chain costs and potential savings?
	Raw material and resources <ul style="list-style-type: none"> • How diversified are inputs and are there substitute markets? • What are the country and supplier risks?
	Production and ordering cycle <ul style="list-style-type: none"> • How does the production manufacturing and ordering cycle work in terms of when, what, and how much to produce? • What is/are the manufacturing plant(s)' utilization rate(s) and what operational flexibility is available to accommodate demand fluctuations? • What would the entity do if a warehouse ran out of stock? • What would the entity if vital inputs run low or are depleted?
	Inventory levels and management <ul style="list-style-type: none"> • How does an entity determine appropriate inventory levels, manage the time to rebuild inventory, and when to stabilize inventory levels? • What are the key elements in inventory planning and management? • How long will current inventory last?
	Supply locations <ul style="list-style-type: none"> • What are the locations and the alternate sources of supply, and could these serve as timely and cost-effective substitutes?
	Transportation and logistics dependency <ul style="list-style-type: none"> • What alternate transport nodes and methods are available and at what cost? • Has a shipment to a warehouse been unexpectedly delayed? How did the entity react?
	Interconnectivity <ul style="list-style-type: none"> • What is the production process's interconnectivity-dependence and concentration risk with regard to other supply chain inputs? • What are the key dependencies and critical linkages?
	IT systems and technology <ul style="list-style-type: none"> • How resilient is your data and systems to cyber risk? • What is your contingency plan to cyber-attack?
	Redundancy and back-up <ul style="list-style-type: none"> • What redundancies and back-up redundancies are built into the supply chain? • What preparations are in place to manage disruptive events?

Source: S&P Global Ratings.

Demand And Supply Disruptions










Clarifying the risks inherent to specific supply chains helps create an understanding of how they could diminish the capacity and willingness of an entity to meet its financial commitments, and thus affect its creditworthiness. We also recognize that entities that successfully manage these risks can demonstrate greater resilience in times of stress, which is generally a credit strength.

Supply-chain considerations are incorporated in our assessment of credit quality, which factors in short-, medium-, and long-term qualitative and financial impacts. Within those parameters, the impact of supply-chain considerations would, if sufficiently visible and material, be factored into our financial forecasts and assessment of business risk.

Our assessment also recognizes that while organizations' supply-chain management is a factor in determining associated risk, the potential for supply-chain disruption is unavoidable and catalysts are often beyond organizations' control, and potentially their ability to forecast. Recent issues, such as the COVID-19 pandemic, have provided examples of demand-and-supply disruptions that have roiled supply chains, both individually and across entire industries (see table 2).

Table 2

Demand and supply disruption factors³

Demand side	Supply side
 Demand surges (COVID-19 related panic buying).	 Labor availability and flexibility (post COVID-19 shortages).
 Sustained increased demand (work-from-home and microchips).	 Transportation availability (container and ship shortages 2021/2022).
 Sudden decline in demand (business district food services).	 Constraints and costs to timely re-allocate supply to different channels.
 Impact of technology (online ordering).	 Manufacturing halts without evident alternatives (COVID-19 factory closures).
	 Critical supplier dependency (gas and grain supplies due to the Russia-Ukraine conflict).

Source: S&P Global Ratings, Supply chain challenges in the post-Covid Era³

Indicators Of Disruption Risks

Identifying potential sources of supply-chain disruption while accepting that their impact is determined (at least partly) by the supply-chain model and its ongoing management, still leaves the need to ascertain how likely it is that a supply-chain event will both occur and prove detrimental.

Useful indicators that can provide insight into the general health of supply chains for organizations include, for example, inventory levels, lead times, and production capacity. The absolute levels of those elements and their fluctuations can thus be indicators of susceptibility to a negative event, while comparing them against an organization's forecasts can also provide valuable information.

Certain ratios (and the changes in them) can also be useful in an assessment of emerging supply-chain stress (or easing pressure). They include, for example:

- Inventory turnover--which tracks how often a company's sales result in inventory replacement.
- Inventory-to-sales--which compares inventory volumes to sales volumes.
- Order cycle time--which measure the time from an order to delivery to the end customer.

Macro indicators can also provide insight into emerging supply-chain strains. For example, the Purchasing Managers' Index (PMI), which tracks supply chain managers' economic sentiments, provides information on economic growth trends (and thus potential emerging or easing pressures) as well as general inventory levels, supplier performance, and delivery times. As is the case on an individual basis, shifts in these factors, can indicate emerging issues, or reduced resilience.

Have A Broad Radar

While the use of supply-chain indications helps identify the level of potential emerging risks, it is critical to understand the degree of material supply-chain dependencies an entity, industry, or country may have. To this extent, a supply-chain topology can prove invaluable to identify supply-chain dependencies, which may interrupt business operations or have wider domino affects. A topology analysis, for example, may focus on geographical distribution within a supply chain. This geographical topology can help provide insight at a macro level into the dependencies of an entity's suppliers in various regions. A concentration of suppliers in a specific country or changes in trade constraints or geopolitical events in those countries, climate physical-risk events, cyber-attacks, economic slowdown, and recession are among the key factors that could depress and disrupt imports, exports, and shipments.

Complex But Important

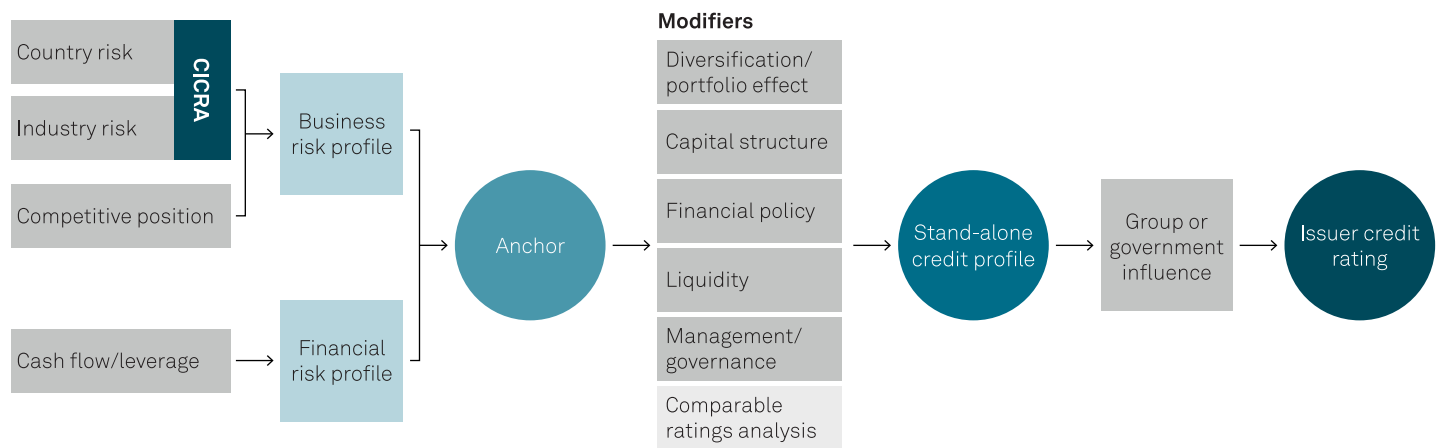
The extent to which events in the last two-three years will influence how issuers manage supply-chain risks remains to be seen. Yet turmoil caused by COVID-19, the Russia-Ukraine conflict, and trade tensions have proven how quickly supply-chain issues can emerge to dominate business and financial risks and weigh on credit quality. That potential for disruption ensures that supply-chain risks will continue to demand ongoing attention and monitoring of risk, particularly in an ever-advancing technological environment.

Appendix

Supply-chain risks may also inform our views on the cyclical nature of revenues and profits that we consider when assessing industry risk. Financial risk from a disruption event would be captured typically through the effect it has on cash flow and leverage. This could include specifically the monetary impact on revenues; operating costs; cost of goods sold; inventory, and liquidity analysis.

Chart 4

Corporate criteria framework



CICRA--Corporate industry and country risk assessment. Source: S&P Global Ratings.

Related Research

- [Right Place, Right Time: Supply Chain Outlook For Third Quarter 2023](#), June 28, 2023
- [Slowing Demand Leaves U.S. Companies Overstocked As Turnover Ratios Decline](#), May 22, 2023
- [Global Shipping 2023: Containerships And Tankers Part Ways](#), Feb. 7, 2023
- [Europe Braces For A Bleak Winter](#), Aug. 29, 2022
- [Global Macro Update: Growth Forecasts Lowered On Longer Russia-Ukraine Conflict And Rising Inflation](#), May 17, 2022
- [Cyber Threat Brief: How Worried Should We Be About Cyber Attacks On Ukraine?](#), Feb. 22, 2022
- [Global Semiconductor Shortages Could Chip Away At The Auto Sector's Recovery In 2021](#), Feb. 10, 2021

External Research

- ¹ Chartered Institute of Procurement & Supply (Intelligence Hub) <https://www.cips.org/>
- ² GEP.com Types Of Supply Chain Models Explained
- ³ “Supply chain challenges in the post–Covid Era”, February 2022: Stephen C. Graves (Sloan School of Management, Massachusetts Institute of Technology, Cambridge, Massachusetts, USA), Brian T. Tomlin (Tuck School of Business, Dartmouth College, Hanover, New Hampshire, USA), Sean P. Willems (Haslam College of Business, University of Tennessee, Knoxville, Tennessee, USA)
- Deloitte: Third Party Credit Risk Mitigating the Risk of Supply Chain Failure
- Evalian: Cyber Security Questions to Ask Your Supply Chain, Marcus Chambers August 2021
- “Forewarned is Forearmed? Contingent Sourcing, Shipment Information and Supplier Competition”, 21 June 2023: Brian T. Tomlin (Tuck School of Business, Dartmouth College, Hanover, New Hampshire, USA), Tao Lu (University of Connecticut Storrs, CT, USA).
- Federal Reserve Bank of New York - Liberty Street Economics - Global Supply Chain Pressure Index
- BIS Working Papers No 1123, September 2023, Global supply chain interdependence and shock amplification – evidence from Covid lockdowns by Sally Chen, Eric Tsang and Leanne (Si Ying) Zhang
- Oracle Netsuite: A Comprehensive Guide to Supply Chain Metrics & KPIs, Abby Jenkins, Sept. 15, 2021

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